

# ROYAL ASTRONOMICAL SOCIETY.

VOL. VII.

February 13, 1846.

No. 4.

## *Report of the Council of the Society to the Twenty-sixth Annual General Meeting, held this day.*

IN presenting to you the Report of our proceedings during the first year of the second quarter of a century of the Society's existence, your Council feel that there is much reason to congratulate you on the general state of our own affairs, as well as on the progress of our science. It is with the sincerest pleasure they announce, that the activity of the Society, under circumstances of some embarrassment, has not suffered any diminution. These circumstances will presently be more particularly described.

The Report of the Auditors, which is subjoined, will shew the state of the finances of the Society :—

### RECEIPTS.

	£.	s.	d.
Balance of last year's account .....	195	8	9
1 year's dividend on £900 Consols .....	26	4	4
6 months' ditto on £2143 14s. 10d. New $3\frac{1}{4}$ per Cents .....	33	16	5
6 months' ditto on £2206 3s. 5d. New $3\frac{1}{4}$ per Cents .....	34	16	2
On account of arrears of contributions .....	109	4	0
48 contributions (1845-46) .....	100	16	0
3 ditto (1846-47) .....	6	6	0
3 compositions.....	63	0	0
11 admission fees.....	23	2	0
9 first year's contributions .....	17	17	0
Sale of Memoirs .....	45	18	0
	<u>£656</u>	<u>8</u>	<u>8</u>

### EXPENDITURE.

Cash paid for Investment of 4 compositions ....	84	0	0
Mr. Harrison, for stationery .....	4	6	6
Mr. Vickery, for law expenses .....	9	8	0
Mr. Basire, for engraving .....	4	8	6
Barclay and Co., for printing Monthly Notices, &c. for Session 1845-46 .....	70	7	6
Carried forward .....	<u>£172</u>	<u>10</u>	<u>6</u>

EXPENDITURE (*continued*).

	£.	s.	d.
Brought forward.....	172	10	6
Cubitt and Co. for fitting up bookcases .....	29	15	0
Lieut. Stratford, for library expenses .....	6	5	0
R. Harris, for 1 year's salary as assistant-secretary .....	100	0	0
R. Harris, for commission on collecting £303 3s. od.....	15	3	2
Charges on books, and carriage of parcels .....	2	13	8
Postage of letters .....	20	2	9
Porter's and charwoman's work, &c.....	9	19	0
Tea, sugar, cakes, &c. for the evening meetings.....	13	13	0
Coals, candles, &c. ....	12	18	6
Sundry disbursements by the Treasurer .....	8	15	1
Taxes { Land tax.....	3	2	6
{ Window duty.....	5	4	9
		8	7
Balance in the hands of the Treasurer (Jan. 22, 1846) .....	256	5	9
	<u>£656</u>	<u>8</u>	<u>8</u>

The assets and present property of the Society are as follow :

	£.	s.	d.
Balance in the hands of the Treasurer.....	256	5	9
3 contributions of 7 years' standing.....£44	2	0	
3       — of 6       ditto .....	37	16	0
4       — of 5       ditto .....	42	0	0
1       — of 4       ditto .....	8	8	0
1       — of 3       ditto .....	6	6	0
19      — of 2       ditto .....	79	16	0
26      — of 1       ditto .....	54	12	0
	<u>273</u>	<u>0</u>	<u>0</u>

£900 3 per Cent Consols.

£2206 3s. 5d. New  $3\frac{1}{4}$  per Cent Annuities.

Unsold Memoirs of the Society.

Various astronomical instruments, books, prints, &c.

The progress and present state of the Society, with respect to the number of its Fellows and Associates, may be best seen from the following abstract, continued from the Report of last year, viz. :

	Compounders.	Annual Contributors.	Non-residents.	Patroness, and Honorary.	Total Fellows.	Associates.	Grand Total.
February 1845 .....	102	125	75	5	307	37	344
Since elected .....	18	10	...	...	28	...	28
Deceased.....	- 2	- 2	- 1	...	- 5	...	- 5
Resigned.....	...	- 2	...	...	- 2	...	- 2
Removals .....	+ 3	- 3	...	...	...	...	...
February 1846 .....	121	128	74	5	328	37	365

The instruments belonging to the Society are distributed in precisely the same manner as recorded in the Annual Report of last year, viz.:—

The *Harrison* clock,  
 The *Owen* portable circle,  
 The *Owen* portable quadruple sextant,  
 The *Beaufoy* circle,  
 The *Beaufoy* transit,  
 The *Beaufoy* clock,  
 The *Herschelian* 7-feet reflector,  
 The *Greig* universal instrument,  
 The *Smeaton* equatoreal,  
 The *Cavendish* apparatus,

are in the apartments of the Society.

The brass quadrant, said to have been *Lacaille's*,  
 is in the apartments of the Royal Society.

The Standard scale  
 is in the charge of the Astronomer Royal, with the consent of the Council, to be used in the formation of a new standard measure, under the direction of the Standard Commission.

The remainder of the instruments are lent, during the pleasure of the Society, to the several parties undermentioned, viz.:

The *Fuller* theodolite, to the Lords of the Admiralty.  
 The other *Beaufoy* clock, } to the Royal Society.  
 The two invariable pendulums, }

The *Lee* circle, to Lord Wrottesley.

The *Wollaston* telescope, to Professor Schumacher.

The Universal quadrant by Abraham Sharp, the Variation transit, and the 7-foot Gregorian reflecting telescope, recently bequeathed to us by our late Fellow,  
 Mr. Shearman,

are in the apartments of the Society.

The printing of the fifteenth volume of the *Memoirs*, which it was hoped would have appeared long since, has been retarded by the illness of the Assistant-Secretary. The Council are, however, glad to report that it is now published. While mentioning this subject, the Council beg to remind the Fellows of the desirableness of communicating speedily any change of residence or title, which may happen, in order that the list may be kept in a state of correctness. It is also desirable that Fellows, who may hear of the death of any Fellow who is not much seen amongst us, should apprise the Secretary of the event.

The sixth volume of *Monthly Notices* was completed with the last session.

It was mentioned in the last Annual Report, that Mr. Sheepshanks had borrowed the portrait of Mr. Baily, for the purpose of having it engraved. The engraving, by Mr. Lupton, is now finished in a beautiful style, and Mr. Sheepshanks has presented a copy to every one of the Fellows. If any one present be not aware of

this, your Council have the pleasure of informing him that his copy will most probably be ready about the end of the present month, and will be given up to his order. You will, undoubtedly, feel that it would be impossible to present to one of our Fellows, as such, a more acceptable memorial of his connexion with the Astronomical Society; and you will join the Council in expressing our obligations to Mr. Sheepshanks, not only for the copies of the valuable print itself, but for the addition to the recorded memorials of a man whose memory must be an object of almost filial veneration to this Society as long as it preserves its own existence.

At the last annual meeting, the Astronomer Royal, then President, in announcing the reasons upon which the Council had awarded the medal to Captain Smyth for his *Bedford Observations*, made some remarks upon the difficulty which arose from the original observations not being before the Society, and concluded by expressing strongly his opinion that those observations should be given up to the Council, that they might have full means of justifying their award. The slips of paper containing the results of the measures had been transferred to Dr. Lee, with the Bedford instruments. In March, however, they were forwarded to our Secretary by Captain Smyth, with the consent of Dr. Lee, and are now the property of the Society, which owes its thanks to both the gentlemen named, for their ready accession to the President's request. The Council, fully concurring in the Astronomer Royal's remarks, have great satisfaction in making this announcement.

It has been for some time understood that it was the intention of our respected colleague, Dr. Pearson, to bequeath to the Society the stock and plates of his most valuable work on *Practical Astronomy*. Some months since he expressed his desire that the Society should take charge of 500 copies, till such time (a distant one we hope) as his bequest should take effect. This request being readily granted, the copies in question were deposited in our apartments: the plates still remain in Mr. Woodfall's custody.

Among the other presents received during the past year may be mentioned the manuscript observations of the Paramatta Catalogue of 7385 Stars, presented by Sir Thomas Brisbane.

To Mr. Turnor the Society is indebted for the gift of the curious manuscript Almanacs described in the recently published volume of our *Memoirs* by our lamented Assistant-Secretary.

The Society has to regret the loss, by death, of the following Fellows:—Admiral Greig, Lieutenant A. P. Greene, General Sir Robert Dundas, Charles Shearman, Esq., and the Rev. Henry Coddington.

Alexis Greig was an Admiral in the Imperial Russian Navy, Member of the Imperial Council, Senator of the Empire, and knight of all the Russian orders. This distinguished officer was ever anxious to promote the education of those under his command, and, aware of the advantages of a practical acquaintance with astronomy, he founded the well-known observatory of Nicolajef on the Black Sea, now so ably conducted by M. Knorre. In his

latter years he was recalled from active service to St. Petersburg, where he was appointed a constant member of the Council of the Empire, and became very useful in forwarding the pursuit of knowledge. The Emperor named him President of the Scientific Commission to which the founding of the great observatory of Pulkowa was intrusted; and there is no question that the successful building and endowment of this establishment are mainly owing to his care and intelligent guidance.

Admiral Greig, who has an additional claim to our regard in being the brother-in-law of our esteemed honorary Member, Mrs. Somerville, after a life of honour and respect, died at St. Petersburg on the 30th of December, 1844; and was buried with every acknowledgement of his rank, services, and worth. It will be recollected with interest, that he was one of the very first Members of this Society; and that he ever expressed a lively regard for its welfare and proceedings. In proof of this, we need but remind the Members of his munificent present to the Society of the universal instrument by Reichenbach, which has been mentioned in the list of our instruments.

Lieutenant Augustus Percival Greene, of the Royal Navy, was a young officer of much promise; for, though cut off in early life, his attainments were sound and extensive. He passed his examination for a commission in the year 1838, and went out to India in the *Cornwallis*, of 72 guns; where, in 1842, he was promoted to the rank of lieutenant for his services on the coast of China. He was now appointed to the surveying-ship *Plover*; and it was quickly found that his skill in mathematics, practical astronomy, and drawing, together with his habits of industry and perseverance, rendered him a very valuable assistant in the responsible duties the vessel was officially engaged in. While thus actively and usefully employed, he was attacked with a fatal remittent fever at Amoy, which carried him off in fifteen days on the 2d of December last. Captain Collinson, the commander of the *Plover*, announced this melancholy and unexpected event with great feeling, concluding in these words:—"His remains were consigned to their last home, under a large tree in the cemetery upon the island of Kolongsu, attended by the consul and the greater part of the military and the merchants, most of whom were well acquainted with his worth, on the morning of the 4th; and it is the intention of Lieutenant Bate and myself to place a stone over the remains of a companion whose loss we feel most deeply."

Lieutenant-General the Hon. Sir Robert Lawrence Dundas, K.C.B., was an officer equally distinguished for his attachment to science, and his attention to military duties. He was the sixth son of Thomas, Lord Dundas, by Lady Charlotte Wentworth, sister of Earl Fitzwilliam. He was born in 1780, and entered the army at the early age of sixteen; but such were his acquirements, that he served with distinction as an engineer officer in the arduous campaign in North Holland in the year 1799. Shortly

after the return of that expedition he embarked for Egypt, and was present in the memorable battle of the 21st of March, 1801. On the surrender of General Menou, he associated with some other officers in a successful endeavour to decipher the Greek inscription on the granite pedestal of the monument outside the walls of Alexandria, which is usually termed Pompey's Pillar; but which, after visiting it for several days successively at the most favourable hour, when the rays of the sun first struck obliquely on the plane of the letters, they fixed to the reign of Diocletian. In 1805, Captain Dundas was sent into the north of Germany with the Royal Staff Corps; and he subsequently served in the Peninsula under progressive advancement, where his behaviour in nine distinct actions gained him the second-class decoration of the Bath, a cross, and three honorary clasps.

Since the peace, General Dundas largely indulged his literary and scientific tastes, and in the application and use of instruments, has proved himself a worthy descendant of the founder of the Zetland family. He died in November 1844, at the age of 64 years.

Mr. Charles Shearman was for many years a Fellow of the Society. He was attached to astronomy, and has bequeathed to the Society the following instruments:—1. A graduated brass plate, with a description, in which it is called, “the Universal Quadrant of Abraham Sharp.” 2. A Variation Transit or Altitude and Azimuth Instrument, by Dollond. 3. A 7-foot Gregorian Reflector, by Banks.

The Rev. Henry Coddington took his degree at Cambridge in 1820, with the honour of senior wrangler. He obtained a fellowship at Trinity College, and also a sub-tutorship, from which in time he retired to the college living of Ware in Hertfordshire. In science, his principal attention was devoted to optics, on which subject all his publications treated, except, we believe, a small anonymous tract which he wrote on the principles of the Differential Calculus. His first work on optics was an elementary treatise, the first in our language which introduced the Cambridge student to modern methods: it was published in 1822, and, though useful, did not exhibit much originality either of matter or manner. His second work, published in two parts at Cambridge (1829 and 1830) is that by which his name as an investigator in mathematical physics will be preserved. The second part treats of optical instruments in an elementary manner; but the first is the most complete investigation of the geometrical laws of reflexion and refraction, in the case of mirrors and lenses, which exists in our language. Taking for his basis the then recently published investigations of Mr. Airy on the path of a ray, whether of a direct or oblique pencil, Mr. Coddington exhibited this very complicated subject in a manner which renders it accessible to any student of moderate mathematical attainments and sufficient industry.

Mr. Coddington died at Rome, whither he had gone for the benefit of his health, in the course of last year. He was much esteemed for his courtesy of manners and benevolence of disposi-



tion, as well as respected for his various attainments. He was a Fellow of this Society from its foundation.

Though the Count Cassini had retired from the pursuit of astronomy long before the formation of this Society, and was not, therefore, one of our associates, it is, nevertheless, impossible to pass over in silence the extinction of this ancient hereditary race of astronomers. He died on October 18, 1845, aged 97. From 1671 to 1793, that is, from the foundation of the Paris Observatory till the period of the Revolution, it was occupied by the four Cassinis in succession. The last of these, the Count Cassini, of whom we are now speaking, was driven out by the National Convention, at the time when he was pressing upon them the reconstruction of the Observatory and the introduction of modern instruments. Though an hereditary dynasty of astronomers was not found very favourable to the interests of astronomy, as tending to perpetuate the ideas and methods of its founder, in lieu of introducing acknowledged improvements from time to time, family groups of distinguished philosophers must always be objects of peculiar interest to the historical inquirer. Community of name and blood magnifies even the aggregate amounts of the successes of the Cassinis, the Bernoullis, the Lemonniers, the Maraldis, the Lalandes, and the Herschels; nor is it without a feeling of satisfaction that we take notice of five of these families having been families of astronomers.

The fifth Cassini, by name Henri, son of Count Cassini, was a judge of the Cour Royale, and was well known for his extensive knowledge of natural history. He died of the cholera at Paris in 1833.

Not long after the last annual meeting, our valuable Assistant-Secretary, Mr. Harris, was seized with a complaint in the knee-joint, which almost wholly incapacitated him from attending to business. It was at one time thought that he might have been restored to health, but, unfortunately, just at the time when the local complaint seemed to yield to medical treatment, rapid consumption came on, and terminated his life on the 25th of December. Mr. Harris was a native of Shipton, near Burford, in Oxfordshire, and was, at the time of his death, in his 35th year. After being occupied, from the age of 19, as a schoolmaster at Greenwich, he passed, in August 1841, into the employment of the Astronomer Royal, in whose opinion he soon ranked very high as a valuable computer and a trustworthy agent. In November 1843, he was appointed to fill the vacancy in the Assistant-Secretaryship made by the resignation of Mr. Hartnup; so that the Council had but time to form the decided opinion they now express of his worth and usefulness, before the first appearance of the disorder which terminated his life. Mr. Harris was a well-informed and even accomplished man, and a successful student of the arts of painting and music. He was also attached to the literature of astronomy, as well as to the practice of its methods. He is the author of a paper on an ancient almanac, which appears in the recently published volume. The Council feel that it will not be easy to supply his

place with a person possessed of so much combined power of being useful to the Society and to the science of astronomy.

It is with much regret that the Council announce the retirement of the Rev. R. Main from the office of Secretary, which he has now held for five years. In addition to the zeal on behalf of the Society which has actuated him, in common with others, Mr. Main has brought to the duties of his office a close acquaintance with practical astronomy, as well as theoretical, and the habits of order demanded by a daily attention to astronomical duties more onerous than those of our Secretaryship. So heavy, indeed, are these last, that the Council acknowledge peculiar obligations to the gentleman who, residing at so great a distance, and pressed by public calls of such magnitude, has for years found time to be the constant superintendent of the routine of our business, and a regular attendant at our meetings. The Council have the satisfaction of announcing that Mr. Sheepshanks has undertaken the vacant office, the one of all others which it is most difficult to supply.

The post of Director of the Edinburgh Observatory, vacant by the lamented death of Mr. Henderson, has been conferred by Government on Mr. Charles Piazzzi Smyth, the second son of our President, who, as is well known to all here present, has been engaged for the last ten years as assistant to Mr. Maclear, at the Cape of Good Hope. Mr. Piazzzi Smyth has lately arrived in England, and is now settled at Edinburgh, and engaged in the performance of his duties. Educated in so good a school, and having hitherto shewn so much zeal in the pursuit of practical astronomy, we cannot doubt that he will do additional honour to the name which he bears; and in that persuasion, the Council feel sure this meeting will join them in congratulating our President on the prospects which have opened to his son.

In the month of May last, a proposition was made to the Council, by the remaining members of the Spitalfields Mathematical Society, then on the point of dissolution, to present to the Society any portion of their library which might be deemed acceptable, on condition that the use of the volumes should be allowed to the members during their lives. The Mathematical Society was well known to most of our Fellows; it was established in 1717, and for a long time contributed to keep up a taste for exact science among the residents in the neighbourhood of Spitalfields. Its antiquity, the circumstance of its having numbered such men as Dollond and Thomas Simpson among its members, and the access which its valuable library gave to such books as a private individual rarely possesses, well entitled it to rank among the scientific institutions of the country. When the Council understood that this ancient society was on the point of dissolution, and received private information, in conjunction with the offer abovenamed, that its members were desirous to keep the library together in some public institution, a Committee was appointed to confer with the members, and to examine the books. That Committee reported in favour of incorporating the Mathematical Society with our own, in



the following manner: That the books, records, and memorials of the Mathematical Society should be made over to the Astronomical Society; that all the members of the former society not already Fellows of this Society should be thereupon elected Fellows without payment of any contribution whatsoever; and that such members of the former society as were already among our Fellows, and liable to the payment of annual contribution, should thereupon be exempt from such liability for the future. The Council adopted the conclusions of this Report, and decided upon recommending their adoption to a Special General Meeting of the Society. The calling of this meeting was necessary, not only because it would not have been proper to have concluded so unusual a bargain without giving the Society at large an opportunity of expressing its opinion, but because, from the conditions agreed upon, it became necessary to suspend, so far as the elections were concerned, the existing bye-laws of our Society. This General Meeting was accordingly held on the 13th of June last; the recommendation of the Council was unanimously agreed to, and sixteen gentlemen (three out of nineteen remaining members of the Mathematical Society being already on our list) were elected Fellows, their right of admission being consequent on the fulfilment of their part of the agreement. The books, &c. were speedily delivered at our apartments, and they are now arranged on shelves in the basement story.

In proposing the above arrangement, the Council were actuated by motives which rendered it of little moment whether the library, &c., which formed the equivalent for the contributions of the Fellows to be elected, was or was not worth the money value of those contributions. It is, nevertheless, satisfactory to be able to state, that the addition thus made to the Society's library is of great value and extent. The number of books is as follows: folios, 76; quartos, 622; octavos, 1444; duodecimos, 314; with about 131 works uncatalogued. Among these there is a considerable number of volumes of worth and rarity.

And, while on this subject, the Council must not forget to state the obligations under which the Society lies to Mr. Stratford, who, with great labour, superintended the comparison of these books with the Mathematical Society's Catalogue, and the due arrangement of them upon the shelves. This assistance, valuable at any time, was doubly so from the unfortunate state of health of the Assistant-Secretary, which prevented him from giving any aid whatever. Mr. Stratford has also undertaken the preparation of a new Catalogue, which shall give the whole of the library, including the recent additions; and in which the books obtained from the Mathematical Society will have a distinctive mark. When this Catalogue is completed, it is the intention of the Council to print it forthwith, for the use of the Fellows.

The Council have awarded the gold medal to the Astronomer Royal for his recent publication of the reductions of the Greenwich Planetary Observations from 1750 to 1830. This work was described generally in the last Annual Report, as about to appear.

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The President will undertake, at the close of the ordinary proceedings of this day, to describe and justify the grounds on which the award was made. The Council will add nothing except their entire conviction, that it rarely happens that so valuable a present is made by the practical to the theoretical astronomer; and seldom indeed, that it is made by one who unites both characters in so remarkable a degree.

The corresponding series of lunar observations is now so far advanced, that only a small revision of some of the later years is wanting. Ten years' reductions in Right Ascensions and North Polar Distance are printed, the Government having supplied the necessary funds; and the formation of the equations for the correction of the elements is in progress. It is remarkable that, though all the lunar tables now existing to which observation has contributed, or which have not been formed from theory alone, have been founded on data procured from Greenwich, that Observatory is yet able to shew that its records are not exhausted. Singularly connected as it has always been with the progress of lunar astronomy, its history has never presented so remarkable an epoch as the present time. The reduction, in the most systematic and usable form, of its old meridian observations, is the work of the Astronomer Royal, who suggested and undertakes the extrameridional course of observation mentioned in the last report.

The altitude and azimuth instrument intended for this purpose has now left the engineer's hands, and is in those of Mr. Simms, for the completion of the micrometers, levels, graduations, &c. It is in a very forward state. The peculiar tables which the reduction of the observations will require are in preparation, and no long time will elapse before it is in use.

The connexion of Pulkowa, Altona, and Valentia with the Observatory of Greenwich has the calculations now completed. The result for Pulkowa is not yet printed; that for Altona differs very little from the one which was found many years ago. The result for Valentia has been compared with that derived from Colonel Colby's survey, the elements for the figure of the earth being those which were given some years ago by the Astronomer Royal, in the *Encyclopædia Metropolitana*. It appears that the geodetic longitudes of Liverpool and Kingston are a very little too large, that of Valentia a very little too small; being just what would take place if the ordinary assumptions employed in determining the figure of the earth were disturbed by an unknown source of attraction beneath the surface of Ireland. A memoir on these results is now in preparation by the Astronomer Royal.

The ordinary star-observations at Greenwich have been, during the past year, in a great measure devoted to filling up the blanks in one element (whether Right Ascension or North Polar Distance) which exist in the recently published catalogue of 1439 stars.

By information received from Colonel Estcourt, who is employed upon the survey of the North American boundary, it appears that the latitudes of various points have been obtained by

the use of excellent twelve and fifteen-inch altitude and azimuth instruments. The differences of longitude have been found (the country presenting no more such difficulties as those described in last year's Report) by instantaneous signals of gunpowder flashes compared with transit observations, made at intervals of three minutes. The accuracy of the results may be inferred from this statement, that the extreme discordance of the determinations of difference of longitude from sixty signals was only four-tenths of a second. The intermediate parts have been filled up by the usual operations of surveying. There is no doubt that the map of this wild tract will be comparable in accuracy to that of any country in Europe. A general map is in preparation on a scale of four inches to a mile, with special maps on that of twelve inches to a mile.

At Cambridge, the observations of comets and of the new planet have, for the present, superseded those of double stars. The volume for 1842 has just been published. Besides the usual matter, it contains the accurate places of a large number of double stars. During the last year, the meridian observations were confined to stars; for the most part, either double stars or stars observed with comets. By this means Professor Challis hopes to complete a second Cambridge Catalogue, at the same time that he effects the reduction of the large number of comet observations which he has taken.

The last year has been marked to the astronomer by the appearance of the Catalogue of the British Association. This inestimable volume, which contains the mean places for 1850 of 8377 stars, with all the requisite aids for obtaining their apparent places for any other epoch, is an extension and completion of the Catalogue published in 1827 by this Society, and so well known as the Astronomical Society's Catalogue. Both were published under the same superintendence, and both bear the name of Francis Baily on their title-pages; but though upon the same plan, yet the second appears with such additions and improvements as render it a new work. For, first, the number of stars is nearly trebled; secondly, from the particular attention which has been paid of late years to this branch of astronomy (chiefly owing, it may be said, to our own Catalogue), the accuracy of the mean places has been immensely increased; thirdly, the secular variations of the precession have been added, as well as the annual proper motions, so far as they are known; and, lastly, in the nomenclature, in the exact citation of authorities, and, it must be added, in the beauty of the getting-up, every thing has been done which the greatest experience and zeal could suggest.

The preface contains a clear account of the process of composing the catalogue, of the formulæ employed or to be employed, of the motives which directed the author in his variations from antecedent authorities,—in short, all that would have been expected from Francis Baily on the subject which had occupied him principally, though not exclusively, for a quarter of a century. The work was completed, with the exception of some notes, and partly printed, at the author's decease, and the task of bringing

the whole to the desired end has been ably performed by his friend and coadjutor in the labour of constructing and printing our former catalogue, Lieutenant Stratford.

But though this volume is, and will be for years, the text-book of the practical astronomer, it must not be received as a perfect work, but as a step — an immense step, to be sure — towards perfection. Our knowledge of the sidereal heavens is yet in its infancy. That every thing must be in motion, in accordance with the laws of gravitation, may indeed be looked upon as demonstrated; but, except the broad notion that our system is moving towards some point of the present apparent heavens, the knowledge of the approximate distances of two stars, certainly of 61 *Cygni* and probably of  $\alpha$  *Centauri*, nothing is accurately known of the things which must become data before the velocity and direction of motion of the centre of gravity of our system can be determined. The late Astronomer Royal, Mr. Pond, was of opinion, and his judgment has recently been confirmed by our illustrious associate Bessel, that a variation in the proper motions of some stars has been detected by observation, and if this be confirmed, the first step is made.\* But the exceeding minuteness of the difference of motions, which themselves require many years to rise to an appreciable amount, presents a difficulty only to be overcome by immense labour and the most scrupulous accuracy. For each star there are required, at least, three different and well-defined epochs; and where are we, as yet, to look for such data?

The Council cannot but mention what is one of the most remarkable astronomical events of the year, though perhaps no one of the parties concerned in it gave our science a thought. They allude to the repeal of the excise duty on glass, which might be called with perfect truth an astronomical window-tax. Every person here present must be aware that the nature of the regulations under which it was found or thought necessary to place the manufacture of this important article, rendered experiments for the improvement of optical glass almost impracticable and a great deal too expensive. It may now be confidently hoped, that in a few years our country will not be obliged to admit that we are surpassed by foreigners in this particular. But it must be remembered that it is not likely that the object will be attained, unless systematic attention be directed towards it. The Council hope, therefore, that those who feel interested in astronomy, and who

\* It may be worth consideration whether a complete recomputation of all Bradley's observations of stars might not be advantageous. The *Fundamenta*, as edited by Bessel, does not include *all* the observations, and the epoch of the observations is not given. This most important element was first added by the present Astronomer Royal, and the yearly partial catalogues which appear in the annals of our observatories are exceedingly valuable from supplying the date. In making the above suggestion we do not forget what we owe to Bessel's *Fundamenta*, nor how much of the reasonableness of our expecting yet more benefit from Bradley's observations lies in the consequences of the impulse which the publication of that mighty work gave to accurate astronomy, and the means which it supplies for still further improvement.



have directed their attention to the chemistry of manufactures, will not forget to keep their thoughts fixed upon the great importance of procuring good optical glass in large quantities. The end to be gained is not merely the acquisition of large object-glasses in greater numbers. The want of sufficient supply, easily obtained, is found in regard to smaller lenses, and no one can positively say, or even reasonably suppose, that the whole manufacture is not capable of great improvement.

An attempt has been made by Mr. Simms to furnish the object-glass for the Liverpool equatoreal from his own workmanship; but the indifferent quality of all the optical glass which is on sale (the Munich unworked glass is not to be bought) did not allow him to attain the degree of perfection which he aspired to. In this dilemma, the Town Council have requested the Astronomer Royal to purchase the object-glass, tube, and eye-glasses, from Merz and Co. of Munich. The mounting which the Astronomer Royal proposes to adopt is that sometimes called the English mounting,—namely, a transit telescope between two supports, which, united at the top and bottom, form the polar axis. Mr. Airy considers that by making these supports of sheet-iron, having a section something like that of a chord and arc, he will get great stiffness and solidity with moderate weight, and at a comparatively small expense. When thus equipped, the Liverpool Observatory will doubtless furnish a plentiful supply of valuable extra-meridional observations. This excellent institution will then be a model of what the science may reasonably look for at the hands of those who attend to the interests of navigation at the principal ports,—namely, ample means of giving time and regulating chronometers, with power to the superintendant of employing the time he has to spare about that class of observations in which a private observer can make himself really useful to the progress of the science.

It was mentioned in last year's Report that Mr. Sheepshanks had undertaken to finish the construction of the standard yard measure commenced by Mr. Baily. On examining the state of progress (for Mr. Baily's last illness seized him when he had hardly commenced his operations) and the points which were left not satisfactorily determined by preceding measures, Mr. Sheepshanks, with the consent of the Committee, resolved upon a more extensive series of experiments than was at first contemplated. It was found by the officers of the Ordnance survey, and by Mr. Simms when repeating the operation, that the hypothesis of equal expansions of metals for equal increments of temperature, as shewn by the mercurial thermometer, is far from exact. Mr. Baily's preliminary measures also shewed that the differences between certain standards had varied sensibly since the time when he constructed the standard scale of the Society. The method of properly supporting a bar has been recently considered by the Astronomer Royal, in a paper contained in our newly published volume. This is not a proper place or time for entering upon the details of processes which must be tried before they are approved of. The

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observed by Tycho Brahé; an elliptical orbit of 249 years' period satisfies the observations very well. Father de Vico saw Encke's comet on two days in the month of July, but it does not appear that other astronomers were so fortunate.

The comet of Biela was found at Berlin with the great Fraunhofer refractor on Nov. 29, and at Cambridge, by Professor Challis, on Dec. 1. At this time it was excessively faint, but the agreement between the observed places and the positions given by Santini's elements is very satisfactory. In the middle of last month the comet became double and presented a most singular appearance, for the nebulosities surrounding the two nuclei scarcely joined each other, and the whole object exactly resembled two comets in very close proximity. This phenomenon was first observed by Professor Challis, with the Northumberland telescope, on Jan. 15. It was, however, seen in America, on the 13th. As viewed in Mr. Bishop's refractor on Jan. 24, the comet was much like the *dumb-bell* nebula in *Vulpecula* seen under small optical power. The distance between the two comets has been since rapidly increasing, and the deviations of the positions of both comets from those deduced from Santini's Elements are now very great.

On the 24th of January last, Father De Vico discovered a telescopic comet in *Eridanus*; this is the third comet detected by our indefatigable associate. On the subject of comets the Council received a letter from our distinguished Associate Professor Schumacher, dated May 5, requesting that the observations made in England might be immediately forwarded to him, and promising a like return. The Council accordingly directed that all observations which came into their hands should be immediately sent to Mr. Schumacher; and they hope that those Fellows who observe comets will lose no time in communicating their observations through Mr. Hind, who has undertaken to forward them to Professor Schumacher.

The return of Mr. Piazz Smyth to Europe enables the Council to furnish the meeting with a short account of Mr. Maclear's geodetical operations.

The anomalies known to exist in Lacaille's southern arc, and which Colonel Everest, when he visited the scene of operation, suspected to have arisen from local attraction on the plumb-line, have been the means of leading Mr. Maclear into a very extensive measurement of the same kind, of which, in such a report as the present, we can only give a passing notice. When, in 1837, Lacaille's Observatory at his southern end was trigonometrically connected with the Royal Cape Observatory, there was found to be error in the latitude of the former, certainly of the kind which the local attractions would cause, but by no means sufficient in amount to explain all the difference between the theoretical and the measured degree. But even this partial explanation was destroyed by Mr. Maclear's subsequent measures with the zenith sector at both ends of Lacaille's arc, which produced results agreeing (as to the length in the heavens of that arc) almost exactly with that of Lacaille. The discordance being thus thrown upon the trigonometrical

part of the operation, Mr. Maclear (1840-41) carefully measured a base of 42,000 feet nearly on the site of Lacaille's, and then re-observed all his triangles, feeling confident that the former stations had been recovered in every instance to within a few feet. The length of the degree thus found halved the difference between Lacaille and the modern state of the theory, being about 200 feet less than that of the former, and about as much more than that of the latter. But, the old triangles being but ill chosen for causing errors of observation to produce their least effects, Mr. Maclear took another and a more advantageously related system, and found a result agreeing almost exactly with his former one. Still the effect of attraction at the southern end only remained imperfectly compensated, and that at the northern not at all. Mr. Maclear then resolved to extend the arc to the length of the usual European ones, to place the terminal stations in the best positions which could be found, to swing the pendulum on every mountain, and to fix the positions of all such points as might be useful in future land or coast surveys. This work has occupied him during the course of the years from 1843 to the present time, and it is not yet completed. Either of four stations may be used independently at the extreme southern end of the arc—the Royal Observatory, Lacaille's Observatory in Cape Town, one on the mountain Zwarte Kop, twenty miles south of the observatory, and one on Cape Point, the extreme south-west of Africa. The most northern station is on the Khamiesberg, giving a total length of about  $4\frac{1}{2}$  degrees, with an intermediate astronomical station on the top of Heer Logiments-berg. From the extreme south to the middle station two sets of triangles are formed; from thence to the northern, one and a part of another. From the Royal Observatory extends an eastern chain of triangles, for the settlement of the position of Cape l'Aguillhas and the measurement of an arc of parallel. The sides of the triangles vary from 50 to 90 miles. The country to the north of Khamiesberg is now under examination, to try the feasibility of carrying the triangulation up to a station at which a perfectly unexceptionable latitude can be obtained. The physical difficulties of the northern part of the triangulation have been enormous. The houses at 20 miles distance from each other: the natives themselves imperfectly, and sometimes not at all, acquainted with the mountains through which the surveyors had to explore difficult passes in most inclement weather—the difficulty of finding water, and the scanty quantity of it when found—the irksomeness and danger of carrying the instruments up ascents which a free and active man can only surmount with difficulty—the endurance of all temperatures, from sand in the plains at  $140^{\circ}$  of Fahrenheit to ice and sleet on the heights—and the possibility of return being cut off by the gathering of snow in the ravines,—present a picture far from inviting, and form a measure of the resolution of Mr. Maclear and his assistants, as well as of the strength of the principle which carried them into those wilds. The Society will join the Council in hoping that their success may be equal to their desert.